

# Autologous hematopoietic stem cell transplantation in a patient with Hodgkin lymphoma on dialysis: Use of brentuximab vedotin as a bridge to transplant

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## Abstract

There is a high cure rate with initial treatment of Hodgkin lymphoma (HL), but for relapsed or refractory disease autologous hematopoietic stem cell transplantation (AHSCT) is the main stay of treatment. AHSCT is a challenge in patients with chronic kidney disease (CKD) due to the nephrotoxicity of the conditioning regimens, however there are reports of successful transplant in patients with multiple myeloma, mantle cell lymphoma, and amyloidosis-induced end stage renal disease (ESRD) requiring dialysis. We could not locate any reports of successful AHSCT in a patient with HL and ESRD requiring dialysis. We present the case of a patient with relapsed HL and ESRD requiring dialysis who was treated with brentuximab vedotin followed by a melphalan conditioning regimen and AHSCT who had long-term progression-free survival. Brentuximab vedotin, an anti-CD30 antibody, is widely used for relapsed and refractory HL and has been shown to improve the success rate of AHSCT. However, it is currently not advised for use in severe renal failure with only two reports of its use in patients with dialysis-dependent renal failure. This case is unique in two regards 1) the use of brentuximabvedotin in ESRD requiring dialysis and 2) successful AHSCT in a patient with relapsed HL and ESRD requiring dialysis.

## Keywords

Hodgkin lymphoma; dialysis; relapsed Hodgkin lymphoma; brentuximab vedotin; hematopoietic stem cell transplant; ESRD

## Abbreviations

HL: Hodgkin lymphoma; AHSCT: autologous hematopoietic stem cell transplantation; CKD: chronic kidney disease; ESRD: end stage renal disease

## Introduction

There have been many advances in the treatment of HL with a relative 5-year survival of 86.2% [1]. Despite a high cure rate with initial treatment, a relapse rate of 10%-30% is still seen after achieving complete remission following primary therapy [2]. The current standard of care for most patients with

relapsed and refractory HL consists of conventional salvage therapy to reduce tumor burden, followed by high-dose chemotherapy and autologous hematopoietic stem cell transplantation (AHSCT) [2-4]. For patients treated with AHSCT for refractory or relapsed HL, long-term progression-free survival is seen in approximately 50% [5].

The use of AHSCT in patients with chronic kidney disease (CKD) presents additional challenges compared to those with preserved renal function due to the toxicity of the conditioning regimen [6]. However, there are multiple studies showing good outcomes and suggesting the feasibility of AHSCT in patients with CKD. Several reports have demonstrated that AHSCT can be successfully performed in patients with multiple myeloma and amyloidosis-induced renal failure requiring dialysis [7-15]. At least one report has also demonstrated a case of successful AHSCT in a dialysis-dependent patient with mantle cell lymphoma [16]. While AHSCT is the standard of care for relapsed/refractory HL, we could not find any reports of successful AHSCT in a HL patient on dialysis. We report a case of a patient with relapsed HL with end stage renal disease (ESRD) on dialysis who underwent AHSCT and had prolonged progression-free survival.

## Case Report

The patient was a 46 year old male with a congenital absence of the left kidney, right renal dysplasia, and ESRD who started hemodialysis in 2000. He had a cadaveric renal transplant in November, 2001 with subsequent explant in March, 2003 due to graft failure. He was on hemodialysis ever since the explant in 2003. In 2007, he was diagnosed with stage III HL and completed six cycles of chemotherapy with ABVD (doxorubicin, bleomycin, vinblastine, and dacarbazine) resulting in complete remission. While being evaluated for another kidney transplant in July, 2011 he was found to have an abnormal positron emission tomography (PET) scan and a liver biopsy revealed recurrent classical Hodgkin lymphoma. The Reed Sternberg cells were positive for CD15 and CD30. He received three cycles of ChlVPP/ABV chemotherapy (chlorambucil, vinblastine, procarbazine, prednisone, doxorubicin, bleomycin, and vincristine) until October, 2011 when therapy was discontinued due to cytomegalovirus pneumonitis. A PET scan in November, 2011 showed marked improvement, but a subsequent PET scan in January, 2012 showed disease progression. He received brentuximab vedotin every three weeks for five doses. The first dose was 1.8 mg/kg and all subsequent doses were given at 1.4 mg/kg due to neuropathy. He had an excellent response to brentuximab vedotin (**Figures 1,2**). In June, 2012 he was treated with 140 mg/m<sup>2</sup> intravenous melphalan followed by AHSCT. He experienced peripheral neuropathy post-transplant and was hospitalized twice for respiratory failure of undetermined etiology requiring mechanical ventilation. A PET scan was performed in July, 2013 and remained negative for disease. He was followed without evidence of disease progression until his death in September, 2016 (51 months post-AHSCT) from complications related to chronic hemodialysis.

## Discussion

Standard therapy for patients with relapsed or refractory HL is high-dose chemotherapy followed by AHSCT [2-4]. In addition to assessments of tumor sensitivity, evaluation of pre-transplant factors such as performance status and organ function are important due to the risks of morbidity and mortality following AHSCT. Deficits in pulmonary, hepatic, and renal function prior to transplant are associated with increased mortality due to the toxicity of the conditioning regimen [17].

One-year transplant-related mortality (TRM) for AHSCT for lymphomas is 4-8% in patients without renal failure [18]. Patients with renal failure undergoing AHSCT typically have higher transplant-related mortality (80-100% when dialysis is required according to one study) due to the toxic effects of conditioning regimens, which have a narrow therapeutic index even in patients with normal renal function [6]. It has been shown that patients with abnormal renal function prior to transplant are at increased risk for complications [19].

With several conditioning regimens for AHSCT in HL, the most common is BEAM (carmustine, etoposide, cytarabine, melphalan) [20]. Melphalan was chosen as the conditioning regimen for AHSCT in this case as it is the standard of care for patients undergoing AHSCT with multiple myeloma and amyloidosis-induced renal failure [21-22]. A pharmacokinetic and toxicity study performed by Tricot, et al. demonstrated that the presence of renal failure does not require a dose reduction of melphalan in autologous transplant for multiple myeloma, nor did it adversely affect post-transplant engraftment or overall survival [23]. However, a more recent study by El Fakih et al. showed a lack of clear survival benefit with higher dose melphalan (200 mg/kg) and potentially higher toxicities compared to lower doses of melphalan (<200 mg/kg) prior to AHSCT in dialysis-dependent myeloma patients [9]. In this case, 140 mg/m<sup>2</sup> melphalan was used as the conditioning regimen. We also chose melphalan as the conditioning agent due to reports of its success with AHSCT in patients with HL and normal renal function [24-26]. To our knowledge, there are no reports of HL treated with melphalan and AHSCT while on dialysis, and this information is not identified by the Center for International Blood and Marrow Transplant Research.

Another interesting aspect of this case is the use of brentuximab vedotin in renal failure. Hodgkin lymphoma (HL) is classically characterized by the presence of CD30-positive cells, termed Reed-Sternberg cells. Brentuximab vedotin is an anti-CD30 antibody conjugated to the anti-tubulin agent, monomethyl auristatin E (MMAE). Brentuximab vedotin has been used to target relapsed or refractory CD30-positive HL with overall response rates ranging from 50%-75% [27-29].

Brentuximab vedotin is currently approved for treatment of HL after failing AHSCT or after failure of at least two prior multi-agent chemotherapy regimens in patients who are not candidates for AHSCT [30]. Anderlini et al. recently showed exposure to brentuximab vedotin allowed more patients to reach allogeneic AHSCT in complete remission even with prior failed transplant [31]. In a large retrospective study on 240 patients with relapsed HL, Perrot et al. showed that of the 145 responders to brentuximab vedotin those who went on to AHSCT had a significantly longer median progression-free survival than those without transplant (18.8 vs. 8.7 months) [32].

Monomethyl auristatin E, the anti-tubulin component of brentuximab vedotin, is renally eliminated. It has been recently determined that severe renal impairment may cause decreases in antibody-drug conjugate exposure and increases in MMAE exposure [30]. Although the use of brentuximab vedotin is currently not advised for patients with severe renal failure (CrCl < 30 mL/min) due to increased toxicity, there are reports of its use in a patient with CD30-positive diffuse large B-cell lymphoma (DLBCL) with end-stage renal disease (ESRD) not requiring dialysis and as a first-line agent in a patient with advanced HL and acute renal failure requiring dialysis [33-34]. To our knowledge, there has been no report of the use of brentuximab vedotin in a patient with relapsed HL and ESRD requiring dialysis as a bridge to AHSCT.

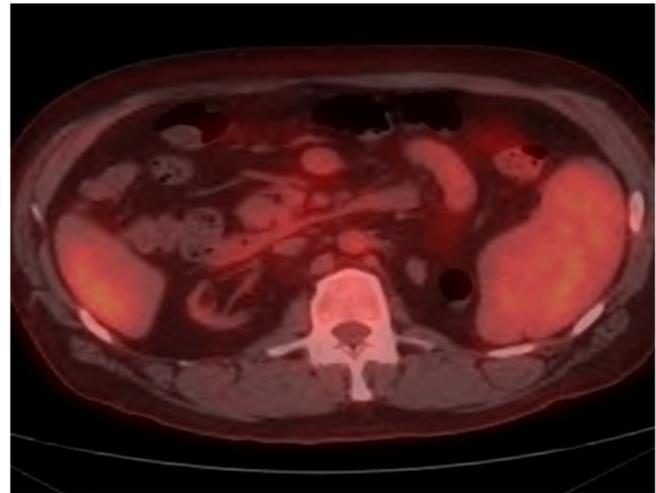
## Conclusion

AHSCT is accepted therapy for relapsed or refractory HL [2-4]. Although AHSCT in patients with renal failure presents additional challenges, this case shows that patients with relapsed or refractory HL should not necessarily be excluded from AHSCT because of the requirement for dialysis. Additionally, this report shows the use of brentuximab vedotin as initial therapy for relapsed disease followed by high-presence of ESRD requiring dialysis.

## Figures



**Figure 1:** PET-CT from January 2012 (Deauville 5) showing a hypermetabolic retroperitoneal periaortic lymph node mass prior to initiation of brentuximabvedotin.



**Figure 2:** PET-CT from April 2012 (Deauville 3) showing a complete metabolic response after administration of brentuximabvedotin before ASCT.

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